CLAIMS

1. Method of turbocoding for the transmission of information in which, a first polynomial with binary coefficients $g(x)$ of degree d and with a constant term equal to 1 having been predetermined, first of all said information is presented in the form of binary sequences $\underline{u}$ of length

$$k = p - d,$$

where p is a predetermined multiple of the period N of the polynomial $g(x)$, and then, for each of said sequences $\underline{u}$, there is produced a triplet $\underline{v}$ of binary sequences $(\underline{a},\underline{b},\underline{c})$ intended to be transmitted and obtained as follows:

- said sequence $\underline{a}$ is of length p and obtained by extending the sequence $\underline{u}$ by means of d "padding" bits so that the polynomial

$$a(x) = \sum_{i=0}^{p-1} a_i x^i$$

associated with $\underline{a}$ is divisible by $g(x)$,

- said sequence $\underline{b}$ is represented by the polynomial

$$b(x) = a(x) \cdot f_1(x) / g(x),$$

where $f_1(x)$ is a second polynomial with predetermined binary coefficients, without a common divisor with $g(x)$, and

- said sequence $\underline{c}$ is represented by the polynomial

$$c(x) = a^*(x) \cdot f_2(x) / g^*(x),$$

where

$$a^*(x) = \sum_{i=0}^{p-1} a_i x^{\pi(i)},$$

where $\pi(i)$ is a predetermined permutation of the integers i lying between 0 and $(p\text{-}1)$, where $g^*(x)$ is a third polynomial with predetermined binary coefficients, of degree d and with a constant term equal to 1, $\pi(i)$ and $g^*(x)$ being chosen so that, whatever the polynomial $a(x)$ divisible by $g(x)$ (mod. 2), $a^*(x)$ is divisible by $g^*(x)$ (mod. 2), and where $f_2(x)$ is a fourth polynomial with predetermined binary coefficients, without a common divisor with $g^*(x)$,

characterized in that there is taken for $\pi(i)$ the residue modulo p of the product $(i \cdot e)$, where e is a predetermined strictly positive integer, relatively prime with p, congruent with a power of 2 modulo N, and not congruent with a power of 2 modulo p, from which it results that $g^*(x)$ is identical to $g(x)$.

2. Turbodecoding method, characterized in that it makes it possible to decode received sequences which have been transmitted after having been coded by means of a turbocoding method according to Claim 1.

3. Method for determining a turbocoding method in which, a first polynomial with binary coefficients $g(x)$ of degree d and with a constant term equal to 1 having been predetermined, first of all said information is presented in the form of binary sequences $\underline{u}$ of length

$$k = p - d,$$

where p is a predetermined multiple of the period N of said polynomial $g(x)$, and then, for each of said sequences $\underline{u}$, there is produced a triplet $\underline{v}$ of binary sequences $(\underline{a},\underline{b},\underline{c})$ intended to be transmitted and obtained as follows:

- said sequence $\underline{a}$ is of length p and obtained by extending the sequence $\underline{u}$ by means of d "padding" bits so that the polynomial

$$a(x) = \sum_{i=0}^{p-1} a_i x^i$$

associated with $\underline{a}$ is divisible by $g(x)$,

- said sequence $\underline{b}$ is represented by the polynomial

$$b(x) = a(x) \cdot f_1(x) / g(x),$$

where $f_1(x)$ is a second polynomial with predetermined binary coefficients, without a common divisor with $g(x)$, and

- said sequence $\underline{c}$ is represented by the polynomial

$$c(x) = a^*(x) \cdot f_2(x) / g(x),$$

where

$$a^*(x) = \sum_{i=0}^{p-1} a_i x^{\pi(i)},$$

where $f_2(x)$ is a third polynomial with predetermined binary coefficients, without a common divisor with $g(x)$, and where $\pi(i)$ is the residue modulo p of the product $(i \cdot e^*)$, where e^* is a number determined in the following manner:

a) a certain number of different sequences $\underline{u}$ are chosen to form what will be referred to as the "representative set",

b) for each strictly positive integer number e less than p, congruent with a power of 2 modulo N and relatively prime with p:

- the total binary weight PB of all said triplets of binary sequences $\underline{v}$ associated with the sequences $\underline{u}$ belonging to said representative set is calculated, and

- note is taken of the value $w(e)$, associated with this value of e, of the minimum weight amongst all these binary weights PB, and

c) in order to implement the coding, the value e^* of e which is associated with the largest value of this minimum weight w is chosen.

4. Device (901) for coding sequences of data intended to be transmitted by means of a turbocoding method according to Claim 1, characterized in that it has:

- means (30) for obtaining, for each sequence of data $\underline{u}$, said sequence $\underline{a}$ associated with $\underline{u}$ by extending the sequence $\underline{u}$ by means of said d padding bits, and

- at least one turbocoder (40) having an interleaver π_1 able to effect the permutation provided for in said method.

5. Decoding device (1101) intended to implement a turbodecoding method according to Claim 2, characterized in that it has:

- at least one turbodecoder (300) having two interleavers π_1 able to effect the permutation provided for in said method, and a deinterleaver π_2 able to reverse this permutation, and

- means (335) for producing a binary sequence $\underline{\hat{u}}$ by removing the last d bits of the estimated sequence $\underline{\hat{a}}$ obtained at the end of the turbodecoding of the received sequences $\underline{a}'$, $\underline{b}'$ and $\underline{c}'$ corresponding respectively to said transmitted sequences $\underline{a}$, $\underline{b}$, and $\underline{c}$.

6. Apparatus for transmitting coded digital signals (48), characterized in that it has a coding device according to Claim 4, and in that it has means (906) for transmitting said coded sequences $\underline{a}$, $\underline{b}$, and $\underline{c}$.

7. Apparatus for receiving coded digital signals (333), characterized in that it has a decoding device according to Claim 5, and in that it has means (1106) for receiving said sequences *a'*, *b'*, and *c'*.

8. Telecommunications network, characterized in that it has at least one apparatus according to Claim 6 or Claim 7.

9. Data storage means which can be read by a computer or a microprocessor storing instructions of a computer program, characterized in that it makes it possible to implement a method according to any one of Claims 1 to 3.

10. Means of storing data which are removable, partially or totally, which can be read by a computer and/or a microprocessor storing instructions of a computer program, characterized in that it makes it possible to implement a method according to any one of Claims 1 to 3.

11. Computer program containing instructions such that, when said program controls a programmable data processing device, said instructions mean that said data processing device implements a method according to any one of Claims 1 to 3.